

RESPONSE AND REQUEST FOR RECONSIDERATION

Support.

The amendments to claims 4, 7, 11, 16, 22, and 23 are submitted in response to the Examiners formal objections or objections as to lack of antecedent basis. Support is evident in the remaining claims. For instance, the term “remaining components” in claim 11 has been replaced by “dispersant and the 2,5-dimercapto-1,3,4-thiadiazole or hydrocarbyl-substituted 2,5-dimercapto-1,3,4-thiadiazole”. These materials are in fact the remaining components, other than (c) and (d), listed in claim 1. In claims 12-14, the expression “the components” has been replaced by “components (a), (b), and either (c) or (d) or both (c) and (d)”, which is directly taken from the list of components present in claim 1. In claims 22 and 23, the expression “composition within the oil-containing composition” is replaced by “reaction product.” Support is found in claim 1.

Claim 19 has been amended to follow the language on page 10 lines 5-9; accordingly, the specification now provides proper antecedent basis for this claim.

New claim 27 finds support in claim 1.

Response.

It is believed that the amendments will obviate the objections and rejections under section 112.

The examiner had also rejected all claims as obvious over Davis, US 4,136,043 or in some instances Davis in view of Le Suer, US 4,087,936 or US 3,520,677.

Davis discloses the reaction product of 2,5-dimercapto-1,3,4-thiadiazole (“DMTD”) with an oil soluble dispersant. Exemplified are dispersants prepared from polyisobutenyl succinic anhydrides or other acids, and various amines. “Dispersants of many types are known” and any of them are considered suitable for reaction with the dimercapthiadiazole. Among those mentioned are carboxylic dispersants as exemplified in some 48 different listed patents, amine dispersants as exemplified in 4 listed patents, Mannich dispersants as exemplified in 5 listed patents, post-treated dispersants as exemplified in some 36 listed patents, and polymeric dispersants as exemplified in 6 listed patents. The carboxylic dispersants are preferred and are described in detail in columns 4 through 8. Among the post-treated dispersants are carboxylic, amine, or Mannich dispersants treated with such reagents as urea, thiourea, carbon disulfide, aldehydes, ketones, carboxylic acids, hydrocarbon-substituted succinic anhydrides, nitriles, epoxides, boron compounds, phosphorus compounds or the like.

To arrive at the composition of present invention would involve a selection, from among the scores if not hundreds of types of dispersants available, one of the non-preferred dispersants and reacting it with the DMTD disclosed in Davis. There appears

to be no motivation in Davis do to this other than the general statement that “any” of the dispersants of many known types are suitable for use. There is no indication that any of the advantages of the present invention would be obtained.

In particular, the present invention provides a lubricant additive which provides multiple aspects of the required functionality to the lubricant with reduced complexity, variability, and typically also reduced overall treat rate. Complexity and variability are improved in that there are fewer components to be added by a lubricant blender to provide the desired levels of B and P. Accordingly, fewer storage tanks are required and the possibility for error in blending is reduced.

This reduction in overall treat rate is illustrative, and particularly notable, in the instance when the borating agent is reacted with the dispersant. Boric acid, a common and inexpensive boron compound, is only slightly soluble in oil and would not normally be used as such in a lubricant formulation. Rather, boron is conventionally supplied to lubricating oils by way of alkyl borate esters, $(RO)_3B$, where the alkyl groups are sufficiently long to impart oil solubility. An example of such a material is the condensation product of an octyl alcohol and boric acid. This material is 2.71% boron by weight, so in order to provide a typical loading of 0.02% B to a lubricant will require 0.75% by weight of the octyl borate. In contrast, when boric acid is reacted with the dispersant (along with the DMTD and optionally the phosphorus), the dispersant itself imparts solubility to the boron. Thus the same amount of boron can be provided more efficiently. In particular, Dr. Craig Tipton, one of the present inventors, prepared a lubricant formulation which included 4.0 wt. percent of a dispersant which comprises 1000 parts of a nitrogen-containing dispersant, reacted with 14 parts of DMTD and 30 parts of boric acid. This formulation contained 0.0203 percent by weight boron. For comparison, Dr. Tipton also prepared another formulation in which only the dispersant and DMTD had been reacted and an oil-soluble octyl borate was added separately. In this case, the amount of the dispersant plus the boron compound was increased to 4.75% to provide the same 0.0204 percent boron. Details are provided in the accompanying Declaration from Dr. Tipton. Neither the advantage of reduced treat rate nor any of the others mentioned herein are suggested by the Davis reference. Thus the present invention may lead to a cost savings, a weight savings, and a reduction in complexity in lubricant formulations.

Separate consideration is requested for new claim 27, which specifies a process in which components (a), (b), and either (c) or (d) or both are heated together. The teaching in Davis is, at best, that a preexisting borated or phosphorylated dispersant maybe reacted with DMTD. Accordingly, it is submitted that claim 27 is unobvious.

Claims 8, 9, and 17-19 were separately rejected as obvious over a combination of Davis '043 and Le Suer US 4,87,936. The claims in question relate to the type of borating agent and relative amounts of components (a) through (d). Le Suer '936 teaches the use of boric acid in certain amounts. In view of the unobviousness of claim 1 and other claims as described above, it is submitted that these claims are also unobvious.

Claims 10 and 17-19 were separately rejected as obvious over a combination of Davis '043 and Le Suer US 3,402,677. The claims in question relate to the use of phosphoric or phosphorous acid and relative amounts of components (a) through (d). Le Suer '677 teaches the use of various types and amounts of phosphorus acids. In view of the unobviousness of claim 1 and other claims as described above, it is submitted that these claims are also unobvious.

Conclusion.

For the foregoing reasons it is submitted that the present claims are unobvious and in condition for allowance. The foregoing remarks are believed to be a full and complete response to the outstanding office action. Therefore an early and favorable reconsideration is respectfully requested. If the Examiner believes that only minor issues remain to be resolved, a telephone call to the Undersigned is suggested.

Any required fees or any deficiency or overpayment in fees should be charged or credited to deposit account 12-2275 (The Lubrizol Corporation).

Respectfully submitted,

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